

MONTHLY WEATHER REVIEW,

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WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

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INTRODUCTION.

In compiling the present REVIEW the following data, received up to May 13th, have been made use of, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at one hundred and thirty Signal Service stations and twelve Canadian stations, as telegraphed to this office; monthly journals and means, one hundred and three and one hundred and twenty-nine respectively, from the former, and monthly means from thirteen of the latter; reports from twenty-five Signal Service Sunset stations; two hundred and thirty-seven monthly registers from Voluntary Observers; forty-nine monthly registers from United States Army Post Surgeons; Marine Records; International Simultaneous Observations; monthly reports of the Weather Services of the States of Iowa and Missouri; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

Upon chart No. II is shown the general distribution of the atmospheric pressure for the month by the isobaric lines. Compared with the means for April of previous years, the pressure for the present month averages decidedly lower, especially in the Northwest.

The local barometric ranges, as reduced to sea-level, for the month, vary as follows: New England, from 1.00 inch on Mt. Washington to 1.26 at Eastport. Middle Atlantic States, 0.80 at Lynchburg to 1.09 at Sandy Hook. Lower Lake region, 0.81 at Cleveland to 0.91 at Oswego and Toledo. Upper Lake region, 0.87 at Chicago to 1.35 at Duluth. Upper Mississippi valley, 0.82 at St. Louis to 1.29 at St. Paul. Missouri valley, 0.84 at Bismarck to 1.19 at Yankton. Red River of the North Valley, 1.06 at Pembina to 1.28 at Breckenridge. Plains of Nebraska and Kansas, 1.21 at Dodge City to 1.47 at North Platte. Rocky Mountain region, 0.80 at Cheyenne to 0.99 at Deadwood. Between Rocky Mountains and Pacific States, 0.50 at Yuma to 0.75 at Salt Lake City and 0.92 at Winnemucca, Nev. California, 0.31 at Campo to 0.66 at Red Bluff. Texas, 0.76 at Indianola to 1.00 at Fort Concho. Ohio valley and Tennessee, 0.62 at Nashville to 0.77 at Pittsburg. South Atlantic States, 0.65 at Jacksonville to 0.93 at Cape Lookout. Gulf States, 0.52 at Mobile to 0.80 at Shreveport and 0.46 at Key West.

Areas of High Pressure.—Seven are described. None of these have been decided.

No. I.—This is a continuation of the high pressure-area spoken of in the March Review as No. X. 1st, it covered the country from Oregon to the Missouri valley, with cold and generally clear weather; a. m. barometer at Virginia City 0.26 in. above normal, and Pike's Peak minimum temperature 3° Fah. 2nd, was central in Montana, but with slightly diminished pressure. 3rd, it moved eastward into the region between the Rocky Mountains and Missouri river, with diminished pressure. 4th, p. m. barometer at Santa Fé 0.13, and midnight at Corsicana, Tex., 0.16, above normals. 5th, central in New Mexico, after which it was dissipated.

No. II.—gradually formed between storms I and II on the 7th. 8th, morning, it reached from the Lower Lakes to the North Carolina coast, with freezing temperatures from northeastern New England northward; midnight, central in the lower St. Lawrence valley. 9th, a. m. barometer at Eastport 0.38 above normal, and temperature below freezing from Nova Scotia and northern Maine northward. 10th, a. m., central on the New England coast, and then disappeared to the eastward, in advance of storm III.

No. III.—appeared in Oregon on the 6th, where the pressure gradually increased until it reached its maximum, 0.17 above normal, a. m. of the 9th. The latter morning it extended southeastward over Utah, and the temperature fell below freezing from Montana and eastern Oregon to Nevada. 10th, morning minimum temperatures below freezing from Nevada, Utah and New Mexico northward; -19° on Pike's Peak. The pressure increased toward Texas. 11th, it disappeared over the country from Arizona to Texas, apparently to the southward, also eastward over the Gulf States.

No. IV.—This high pressure-area was central, morning of the 14th, north of the Upper Lakes, with freezing temperatures in northern Michigan. 15th, a. m. barometer at Marquette 0.20 above normal. During the day it extended southeastward over New England. 16th, a. m. barometers at Marquette 0.24, and Portland, Me., 0.29, above normals. 17th, a. m. barometer 0.36 above normal at Chatham, N. B., and freezing temperatures from Nova Scotia to the mouth of the St. Lawrence. 18th, a. m. barometer 0.48 above normal at Sydney, Cape Breton, and then rapidly passed to the eastward, also southward along the coast.

No. V.—advanced southeastward, night of the 22nd, over the mouth of the St. Lawrence. 23rd, a. m. barometer at Father Point, Ont., 0.35, and midnight at Sydney, C. B., 0.46, above normals. The remainder of the month it remained almost stationary over Nova Scotia and the Gulf of St. Lawrence, oscillating backwards and forwards, with the barometer at Sydney, C. B., 0.45 above the normal the last day.

No. VI.—22nd, the pressure rose somewhat above the normal along the Pacific coast. 23rd, it extended eastward across the Rocky Mountain range. 24th, the barometers at Cheyenne and Santa Fé 0.10 above normals. 25th, it withdrew to the southwestward; at midnight it reached from California to New Mexico. 26th, remained about stationary. 27th, moved to Utah, Nevada and California; midnight barometer at San Francisco 30.20 in., or 0.13 above normal. 28th, continued northward toward Oregon. 29th, barometer at Portland, Or., 30.37, or 0.24 above normal. 30th, it apparently disappeared to the northward.

No. VII.—27th, it advanced southward over Minnesota; barometer at Duluth 0.12 above normal. 28th, highest over Lake Superior, and later disappeared.

Areas of Low Pressure.—Of these ten have been traced and charted. Nos. I, II, V and VI developed into very severe storms.

No. I.—2nd, it advanced northward over Florida at night. 3rd, the pressure diminished very rapidly; barometer at Wilmington fell to 29.37 in., or 0.65 below the normal. It developed into two distinct depressions, with heavy rains and occasional thunder-storms from Florida to North Carolina, and easterly gales on the coast. The schooner "Steelman" was struck by the high NW. winds following it off Pensacola, and driven to Key West. 4th, the secondary depression disappeared, as shown on chart No. I. The storm-center moved northeastward off the coast, producing heavy gales, at times of hurricane force, high seas, and heavy rains. At Kittyhawk, N. C., the barometer fell 0.73 below the normal. During the three first days of the month, the pressure continued low in Nova Scotia, evidently due to the storm described as No. XVII in the March Review, and, now, again began decreasing. 5th, it reached the coast of Nova Scotia, producing northeasterly gales, with rain and snow, thence to the mouth of the St. Lawrence. 6th, the barometer at Halifax fell to 28.83, or 1.00 below the normal. Cautionary Signals were ordered the 3rd, from North Carolina to New Jersey, and the 4th for the New England coast. Warnings were also sent, night of the 4th, for Canadian stations in Nova Scotia, New Brunswick and the St. Lawrence valley. Except for the New England and northern New Jersey coasts, all were justified. Maximum hourly velocities—Key West, NW. 44; Jacksonville, W. 34; Cape Lookout, E. 60; Cape Hatteras, NE. 72; Kittyhawk, NE. 64; Cape May, NW. 38; Eastport, NE. 26; Father Point, E. 52 miles.

No. II.—This severe storm evidently resulted from the combination of two disturbances, one of which apparently advanced northeastward over Texas, producing frequent rains from thence to Indian Territory and New Mexico on the 7th. The other was felt on the 7th at Victoria, British Columbia, as a SW. gale, and at Umatilla, Or., as a W. gale of 60 miles hourly velocity, while the pressure rapidly diminished from Montana to Minnesota. 8th, threatening and rainy weather, with frequent thunder-storms, was reported from the Gulf States to the Upper Lakes and Northwest. From western Dakota to Colorado northerly gales prevailed, with heavy snow at places. The two united, and were central in eastern Nebraska by midnight. At Omaha the barometer fell 0.81 below the normal. 9th, as the storm progressed northeastward over Minnesota, the central pressure continued diminishing, the barometer at St. Paul falling to 28.85, or 1.00 below the normal. A barometric trough ran southward into the Gulf. The rain-area extended eastward over the Lake region, Middle States and South Atlantic States, with frequently heavy thunder-storms and occasional hail. Clear weather prevailed in the Southwest; northwesterly gales, with snow, from Colorado and western Nebraska to Montana and western Dakota. 10th, the barometers fell at Breckenridge, St. Paul and Duluth to, respectively, 28.85, 28.83 and 28.78, or 1.07, 1.09 and 1.10 below the normals. The center passed northeastward into Canada, with the barometric trough reaching to the South Atlantic coast. During this and the preceding days the barometric gradient was unusually steep from the Northwest to the

Upper Lakes, producing very stormy weather, the winds at times reaching a hurricane force, and causing considerable damage. Clear and clearing weather followed from the Gulf States to the South Atlantic States, Ohio valley and Missouri valley, while the rain-area extended to New England. 11th, the winds diminished in force in the Lake region, with clearing weather. Cautionary Signals were displayed on the 7th along the West Gulf coast; on the 8th along the East Gulf and Atlantic coasts, except Maine, and at all the Lake stations. Warnings were also telegraphed the 8th for the Canadian stations, along Lakes Huron, Erie and Ontario, and in the Upper St. Lawrence valley. They were justified, except along the New England coast and Lake Ontario and at Key West. Maximum velocities—Indianola, W. 36; Mobile, SE. 30; Charleston, SE. 33; Smithville, N. C. S. 42; Kittyhawk, SE. 50; Barnegat and Atlantic City, E. 25; Erie, SE. 43; Toledo, SW. 45; Alpena, SW. 28; Grand Haven, SW. 36; Milwaukee, SW. 54; Escanaba, S. 48; Marquette, SE. 34; Duluth, NE. 48; St. Paul, SE. 36; Breckenridge, N. 42; La Crosse, S. 44; Davenport, SW. 48; Cairo, SE. 46; Leavenworth, SW. 52; Yankton, NW. 48; Bismarck, NW. 60; Dodge City, N. 44; North Platte, NW. 66; Cheyenne, NW. 37; Pike's Peak, NW. 52 miles.

No. III—gradually formed as a subsidiary depression to No. II, and was central afternoon of the 11th on the Middle Atlantic coast, with fresh to brisk winds. Thunder-storms occurred from the South Atlantic coast to southern New England. 12th, it increased very much in intensity as it moved northeastward along the coast. The barometer at Portland fell to 29.29, or 0.61 below the normal. High northwesterly winds, or gales, prevailed in the Middle Atlantic States and southern New England. 13th, a. m. barometer at Eastport 29.26, or 0.65 below the normal. It disappeared to the eastward over Nova Scotia. Signals were displayed night of the 11th along the eastern New England coast, and all justified. Warnings were dispatched a. m. of the 12th for the Canadian stations in Nova Scotia and New Brunswick. Maximum velocities—Cape May, N. 40; Sandy Hook, W. 43; New London, E. 26 and NW. 27; Boston, SE. 35; Eastport, E. 30; Father Point, E. 45; Mt. Washington, E. 54 and NW. 66 miles.

No. IV.—It is quite probable that this storm originated on the 12th between the Pacific coast and the Rocky Mountains, and then extended eastward toward the lower Missouri valley, Indian Territory and northern Texas. 13th, the p. m. barometers at Salt Lake City and Dodge City read 0.47 below the normals. At Julian, southern California, a severe rain and wind-storm prevailed; at Winnemucca, Nevada Territory, heavy snow-storm; at Fort Sill, Indian Territory, thunder and hail-storm; at Cottonwood Falls, Emporia and Kirksville, Kan., a tornado, with very large hail, sweeping cars from the railroad track and killing several persons. The midnight barometer at Virginia City fell 0.49 below the normal. 14th, frequent rains fell from the Gulf States to Ohio, Lake Michigan and the Northwest, with occasional thunder-storms; destructive hail-storm occurred at Lamar, Mo.; heavy snow in Utah and southern Nevada. 15th, while the pressure continued low in Kansas, a subsidiary depression formed in the Gulf States, producing heavy thunder-storms at places. At Waterville, Kansas, a waterspout is reported to have formed. 16th, the subsidiary depression passed eastward over southern Georgia. The pressure having been high to the northward, northeasterly gales and heavy rains occurred along the North Carolina coast, for which signals had been displayed the previous day. At Cape Lookout, NE. 48; Kittyhawk, NE. 44; Cape Henry, NE. 48 miles. 17th, the main depression united with the following storm, as shown on chart No. I.

No. V.—13th, light rains fell in Washington Territory and Oregon, with a heavy hail-storm at Eugene City, Or. 14th, the barometers at Portland, Or., and San Francisco read 0.44 below the normals. Light rains prevailed in California; at Julian, Cal., heavy rain-storm, turning into a blinding snow-storm at night. 15th, a. m. barometer at San Francisco 0.48 below normal, and the storm-center passed into the interior. Heavy rains accompanied it in California and light snow in Nevada. 16th, heavy snow fell in northern Arizona, Utah and southern Montana, and light rains in the southern portions of California and Arizona. Southerly gales began from New Mexico and northwestern Texas to Wyoming and western Dakota. 17th, the barometers at Cheyenne and North Platte fell, respectively, 0.58 and 0.68 below the normals. Gales prevailed from the Northwest to Colorado and Indian Territory, with threatening and rainy weather and frequent thunder-storms; heavy snow from Montana and Wyoming to Utah; on Pike's Peak, severe snow-storm, with the temperature 9° below zero; at Leavenworth, Kan., and Olivet, Dak., tornadoes; at Deadwood, Dak., ("Black Hills,") heavy rain-storm. 18th, its progress was very slow. The a. m. barometer at Bismarck read 0.72 below the normal, but the central depression rose during the day. Rainy weather and southeasterly gales continued in Minnesota and Dakota, changing into a severe snow-storm at Deadwood; to the southwestward of the storm-center, as far as Colorado, westerly gales, with clear or clearing weather. 19th, it continued diminishing in force, but with frequent thunder-storms and hail in the Upper Mississippi valley and Upper Lake region. A barometric trough reached southward into Texas, in which, as the wind suddenly shifted from southerly to northerly, it became destructive at places; at Fort Concho, Tex., a heavy hail and rain-storm resulted, causing great damage—hail two feet deep in places—the northwest wind blew with hurricane force for some time. 20th and 21st, during its passage northeastward, rainy weather, occasional thunder-storms and brisk to high westerly winds accompanied it from the Lower Lakes and Middle States eastward. The Signals displayed on the Texas coast the 17th were not justified; those on Lakes

Michigan and Superior, night of the 17th, were lowered too soon; of those along the New Jersey and North Carolina coast, the latter were not justified. Maximum velocities—San Francisco, SW. 28; Pike's Peak, SW. 64 and NW. 56; Fort Bayard, N. M., SW. 43; Fort Craig, N. M., SW. 40; Denver, W. 50; Cheyenne, NW. 44; Colorado Springs, W. 60; North Platte, SE. 96 and W. 66; Dodge City, SE. 40 and SW. 52; Bismarck, E. 74 and N. 60; Breckenridge, E. 50; St. Paul, SE. 33; Duluth NE. 30; Marquette, SE. 36; Milwaukee and Port Huron, W. 36; Sandy Hook, W. 30; Thatcher's Island, W. 36; Mount Washington, NW. 102 miles. Warnings were sent, night of the 17th, for the Canadian stations on Lakes Huron and Erie.

Nos. VI and VII.—18th, the pressure rapidly diminished along the Pacific coast, with a high wind at Victoria, British Columbia. 19th, continued diminishing; barometers falling below normals 0.47 at San Francisco and 0.53 at Portland, Or. Light rains fell from Washington Territory to California. 20th, a. m. barometer at Salt Lake City 0.42 below normal, and diminishing pressure from the Missouri valley southward. The rain-area extended eastward partly as snow to Montana, Idaho, Utah and Arizona. 21st, p. m. barometer at Yankton 0.58 below normal. Threatening and rainy weather prevailed from the Upper Lakes to the Northwest, with frequent thunder-storms; severe hail-storms in Iowa and Illinois; tornado in northwestern Iowa. 22nd, it appeared as an extensive barometric trough, reaching from Minnesota to Texas, and No. VII developed. Rainy weather was reported from the Southwest to the Northwest and Lake region. 23rd, generally light rains fell in the Lake region; frequently very heavy rains and destructive thunder-storms, with hail, from the lower Ohio valley and Missouri to Alabama and eastern Texas; tornadoes at Corsicana, Texas, and Green Springs, Alabama. 24th, passed northward over Lower Michigan, but with frequent rains and heavy thunder-storms from the Lake region southward; at Rome, Ga., a tornado; midnight barometer at Alpena 0.81 below normal. Cautionary Signals were ordered the 22nd for Lakes Superior and Michigan, but late, also from New Jersey to North Carolina; 23rd, for the Gulf coast, and from North Carolina to New Jersey; 24th, for the Lower Lakes and southern New England. Maximum velocities—San Diego, S. 32; Salt Lake City, S. 32; North Platte, E. 60; Bismarck, NE. 60; Cairo, SW. 55; Galveston, NW. 40; Cape Lookout, S. 72; Sandy Hook, E. 36; Cleveland, SW. 45; Detroit, S. 42; Duluth, NE. 38 miles.

No. VIII—developed the 25th in southern Michigan from No. VII. 26th, 27th and 28th thunder-storms were frequent in the Middle States, and heavy at places with hail. The last day very destructive hail storms occurred in southeastern Virginia, Maryland and Delaware. 29th, it was dissipated, as shown on the chart. Cautionary Signals on the New Jersey and New England coasts were not justified except at Eastport; those on the North Carolina coast were late. Maximum velocities—Capes Lookout and Hatteras, SW. 36; Eastport, NE. 35.

No IX—was not of much importance. Moderate rains fell in Cuba and southern Florida, accompanying thunderstorms, with very brisk southeast winds at Key West.

No. X.—Light rains accompanied this disturbance from the Northwest to the Upper Lakes, with occasionally high winds; Bismarck, W. 42; Breckenridge, NW. 35; Milwaukee, SW. 34 miles.

INTERNATIONAL METEOROLOGY.

STORMS.—*December* 31st—York Factory, Hudson's Bay, B. A., noon, heavy northerly gale commenced reaching a velocity of 47 miles at midnight, and from midnight to 2:45 a. m., January 1st, averaged 71 miles per hour, with squalls estimated at 100. At 2:45 a. m. the anemometer was blown away, and the following velocities were estimated: 2:45 a. m. to 6:33 a. m., average 50 miles, and 6:33 a. m. to 9 a. m., average 40 miles. It was preceded by fresh southerly winds on the 30th, and followed by cold and strong NW. winds until the 6th; the thermometer registering -33° on the morning of the 3rd, the lowest reading recorded during the months of December, January and February.

January—4th, 51° S., 81° W., heavy SE. winds. 8th, 49° N., 7° W., heavy sea. 21st, off San Francisco, 5:30 p. m., SE. gale, rain. 22nd, off San Francisco, 4:30 a. m., SE gale increased; 11 a. m., tremendous sea.

February—3rd, $28^{\circ}06'$ S., $53^{\circ}12'$ E., violent rotary gale, lasting a few hours. 7th, $29^{\circ}30'$ S., 44° E., terrific NE. gale, veering to NW. and ending at SW.; barometer 29.30; fearful cross-seas, lasting 16 hours; land and sea birds fell on deck exhausted. Tahiti, Society Islands, hurricane; 129 persons reported killed and much property destroyed. 10th, $57^{\circ}55'$ S., 64° W., heavy gales. 15th, $48^{\circ}54'$ N., $18^{\circ}30'$ W., heavy NW. to SW. gale. 16th, outer bank, off San Francisco, terrible gale, with seas mountain high. 20th, Fowey Rocks, Florida Reefs, 5 a. m., wind SSE. and heavy seas, driving steamer Arratoon on reefs.

March—4th, $41^{\circ}19'$ N., $52^{\circ}44'$ W., heavy SSW. gale, with tremendous sea; about 28° N., $67^{\circ}54'$ W., SE. gale going around to SW. and blowing furiously for 48 hours. 11th, $48^{\circ}08'$ N., $46^{\circ}35'$ W., 7:35 a. m., Wash., M. T., barometer 29.39, wind NW. 24 miles; 2 p. m., W. by N., 60 miles; 5:30 p. m., barometer 29.22, lowest point. 12th, 42° N., $44^{\circ}50'$ W., 7:35 a. m., Wash., M. T., barometer, 29.59, wind NW. 60 miles. 13th, 46° N., 45° W., hurricane from W., with heavy sea. 24th, $45^{\circ}17'$ N., $38^{\circ}47'$ W.,